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FY 1975-1976 International Building Research Activities, Center for Building Technology

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ABSTRACT

This report documents international building research activities of the Center for Building Technology (CBT) during Fiscal Year 1975 and 1976 (July 1, 1974 - June 30, 1976). CBT carries out extensive interactions with foreign and international research organizations to exchange building research information and coordinate similar building research efforts. This report presents a summary of CBT's cooperative programs in building technology, international organization memberships, exchange programs, information exchanges, and foreign visits to NBS.

Key Words: Building research; cooperative programs; information exchange; international building research; international organization memberships; special foreign currency programs.

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INTRODUCTION

This report reviews the Center for Building Technology (CBT) research activities and involvement during FY 75 and FY 76 (July 1, 1974 - June 30, 1976) with the international building research community. The report describes activities with the Centre Scientifique et Technique du Batiment, France; The Building Research Establishment, United Kingdom; and other national building research institutions and organizations. The report provides a review of the various international building research projects; activities with memberships in various international organizations, exchange programs, and information exchanges.

This report also includes names of CBT's principal researchers involved in the international building related research activities. They are listed to provide a means for the interested reader to directly contact technical individuals for specific information.

FORMAL COOPERATIVE PROGRAMS IN BUILDING TECHNOLOGY

US/FRANCE COOPERATIVE PROGRAM

Centre Scientifique et Technique du Batiment
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During a Paris meeting in 1969, the Presidents of the United States and France discussed their mutual desire to renew scientific and technical cooperation between their respective countries. One of the end results of their discussion was the establishment of a cooperative information exchange program focused on building technology between the US National Bureau of Standards' Center for Building Technology (CBT), and the French Centre Scientifique et Technique du Batiment (CSTB).

The purpose of the program was to encourage scientific cooperation between the US and France so as to allow both countries to move forward with significant research and development without costly, time-consuming duplication of effort.

In addition to the exchange of technical information and long-term exchange arrangements for individual scientific personnel, the program agreed upon between CBT and CSTB included provision for shorter-term exchange visits by American and French teams, to compare progress in various aspects of building technology.

The first US team to visit France under this agreement, in November of 1969, was concerned with the over-all scope of investigations to be pursued by the exchange teams: economic appraisal of buildings; qualitative assessments; industrialized buildings, and related topics. A French team returned the visit in January, 1970, and spent approximately two weeks at CBT. Subjects discussed included urban acoustics, climatology, fire research, single-family housing, lightweight construction, and the performance concept.

Subsequent visits by teams and individuals involved investigations or progress in such areas as environmental engineering, the effects of sonic booms on buildings, and experiments in the rehabilitation of existing structures.

The following material outlines and describes the activities of FY 1975 and 1976.

Environmental Engineering

Specific areas of current work include: correlation of computer calculation studies made by CSTB (analog) and CBT (digital); climatological data; room air distribution and convection; ventilation of dwellings, humidification of supply air; overall design of a French prototype apartment building heated by electricity; heat pumps; solar energy; energy conservation; air cleaning problems; hospital environments; thermal performance of whole buildings; instrumentation; physiology; air leakage of ducts; evaporative air cooling; American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) activities; electrical distribution problems; moisture transfer; smoke and ventilation; tightness of double glazed windows; mechanical vibration and plumbing noise.

In mid 1974 Mr. P. R. Achenbach, Chief of the Building Environment Division, and Dr. T. Kusuda, Acting Chief, Thermal Engineering Section, CBT, participated in the Second Symposium of Thermal Engineering Calculations by Computers, held in Paris.

Four months later, Messrs. J. Borel and Mr. Rubenstein, of CSTB, came to the US for two weeks to discuss energy conservation and air cleaning. In addition to NBS, they visited ten other US organizations involved in these projects.

Research material requested by then CSTB Director G. Blachere concerning the placement of insulation on the outside of buildings, and on consumer product performance including labeling of building appliances for energy

efficiency was provided. CSTB is conducting preliminary work to determine the amount of solar radiation available in France. Mr. Frank Powell, Assistant Chief, Building Environment Division, CBT, sent information about the research results on CBT Solar Test House to CSTB. This included Technical Note 892, Retrofitting a Residence for Solar Heating and Cooling: The Design and Construction of the System, which describes basic construction of the solar system and its anticipated performance. Dr. James Hill, Thermal Environment Section, CBT, is providing additional reports as they become available. In May 1976, Mr. Moyer and Mr. Johanovic of the CSTB solar energy section visited and inspected the solar research activities at CBT and visited six other solar energy sites in the United States.

Exploratory Team Visits

Initially the subjects of CBT/CSTB team visits had dealt specifically with technical matters in the area of applied building technology. Early in 1972, however, plans were made for a special US team to visit France for the purpose of examining the application of modern planning, design, and construction techniques to a particular building type—health care facilities.

The team, which visited France in April, 1972, was headed by Mr. Samuel Kramer, then Chief of the Office of Federal Building Technology, CBT. While previous teams were composed entirely of building researchers from CBT, this US team included representatives of other US federal agencies interested in health facilities planning—the Department of Health, Education, and Welfare, the Veterans Administration, and the Department of Defense.

A letter report on the US team visit to France on Health Care Facilities was sent to CSTB and to the French Ministry of Health in June 1976. The report summarized the observations made by the US team, and was offered as a source document for future discussions on the planning and design of medical and health care facilities. Some of the specific

areas summarized are as follows: the application of industrialized construction methods; the use of new materials; the use of new construction techniques and methods aimed at speeding the delivery of the completed facility; the recognition of the need for flexibility in the structures to meet changing needs; the environment created within the buildings; the economics of the facilities considering life cycle costs including initial costs, the operating costs, and the anticipated costs for renovation and rehabilitation.

During June 7-21, 1974, a US team visited France to view and discuss examples of industrialization applied to residential construction. The team, consisting of six members from government and private industry, was under the direction of Dr. E. O. Pfrang, Chief, Structures, Materials and Safety Division, CBT, and included Mr. J. G. Gross, CBT's Chief of the Office of Housing and Building Technology. Following a briefing at CSTB, the team visited fifteen building sites and saw a wide variety of innovative building techniques. The team also learned about labor, financing, and certification practices in French Building. Subsequent to the visit a letter report, "Industrialization Applied to Residential Construction" was prepared and sent to the team members. The report contains observations about French construction and new building systems during the two week visits to Paris and vicinity and southern France.

Following the visit by the French school team to the US in March 1975 a bilingual summary report was delivered to CSTB in April 1975. The report noted a large number of similarities and differences between the two systems in use by each country; it included plans and specifications of the US schools visited, observations about centralized versus decentralized administration, and building regulations as they impact the US school construction community. Based on this exchange of information, it was suggested that a US school team would visit France in the Fall of 1976 or Spring of 1977.

Wind Loads on Structures

In June 1974, Dr. Emil Simiu of the Structures Section, CBT, visited CSTB installations at Paris and Nantes to examine the new wind study facility and to discuss such topics as wind structures in extratropical storms, and thunderstorms, wind structure in suburban terrain, measurement of wind over hills, wind climatology, micrometeorology, dynamic response, and aerodynamics of low-rise structures.

In May 1976, Dr. Simiu under a guest worker agreement to CSTB began working in the field of wind engineering for 6-9 months. He will utilize the complementary resources of CBT and CSTB, including the CSTB Boundary-Layer Wind Tunnel at Nantes for wind engineering research pertaining to the structural safety and service-ability of buildings.

Water Supply and Drainage

Dr. Galowin, Chief, Building Services Section, CBT, and Mr. Perrier Assistant Section Chief, Techniques of Service Equipment Section, of CSTB, have been discussing water supply, plumbing and drainage. Dr. Galowin indicates that some work currently underway in France on advanced single stack drainage systems, grinders for water closet waste, and pressurized small pipe sewage lines in buildings could contribute to the performance approach for the US building regulatory system. Exchange information in return from CBT can be made on stack dynamics drain-waste-vent systems. Cooperation toward these goals is now underway.

Dr. Jean-Noel Andre of CSTB, Grenoble Laboratory, began a one-year guest worker assignment at CBT in September, 1975. He is working on the Materials and Composites Section, CBT, on the reduction of corrosion in waterpipes in buildings. The study concerns the cause and effect relationships of various corrosion factors, and the degree of corrosion reduction obtainable through the use of silicate compounds.

Fire and Live Loads Safety

In response to recommendations of the National Commission for Fire Prevention and Control calling for updated technical information on fire loads, the General Services Administration, the Building Research Advisory Board of the National Academy of Science, and the National Bureau of Standards conducted a survey of 23 nationwide office buildings to determine fire loads and live loads in office buildings. Results obtained from a nationwide survey carried out by CBT are contained in the documents A Program for Survey for Fire Loads in Office Buildings, NBS Technical Note 858, and Survey Results for Fire and Live Loads in Office Buildings, NBS Building Science Series 85. Both were authored by Dr. C. Culver, Disaster Research Coordinator, CBT, and they were transmitted to CSTB. These reports complement data recently obtained by the European Convention for Constructional Steelwork in a similar study completed in Europe.

Sensory Environment

Exchanges of current studies of work on the sensory environment are continuing. Primarily, they concern methods of physical measurement in psychoacoustics. Dr. Simone L. Yaniv, Research Psychoacoustician, CBT, discussed this work with Mr. Josse, Chief, Acoustics Division, CSTB, in May while she was a participant in the symposium hosted by the French Ministry on the Quality of Life Environment. Both the hardware and software for the community noise measurement system have been completed by the NBS Applied Acoustics Section and were shipped to CSTB in June 1976.

Economics

In mid-1975, Dr. Harold Marshall, Chief, Building Economics Section, CBT, furnished several building economics research reports to Mr. Urien, Chief, Economics Division, CSTB, and they are continuing this exploratory work. Research areas of common interest are: the economics of solar energy, and other energy conservation measures, the rehabilitation or abandonment of old buildings, and manpower in construction.

Durability of Materials

Dr. W. Rossiter, Materials and Composites Section, CBT, returned from a fifteen month assignment at CSTB in June 1974. While there Dr. Rossiter measured the thermal movement of plastic foam materials used as insulation in roofing systems. A detailed description of the project on the dimensional stability of polystyrene roofing insulation will be published in both English and French.

Translations of Research Reports

Seven translations of French research reports published as NBS Technical Notes have been well received by the US building community. Approximately 2,000 copies of each of the following were published:

- Tech. Note (TN) 710-1; Building research translation: Account of the Principles of modular coordination: Industrialization in building.
- TN 710-2; Building research translation: An investigation of the protection of dwellings from external noise through facade walls.
- TN 710-3; Building research translation: New regulation of ventilation of dwellings, fixed heating facilities, and flues.
- TN 710-4; Building research translation: Thermal comfort requirement adjacent to cold walls-application to glazed opening.
- TN 710-5; Building research translation: Use of an air-to-air heat exchange to recover heat from air exhausted by mechanical ventilation.
- TN 710-6; Building research translation: Ventilation air inlets for dwellings; and
- TN 710-7; Building research translation: Weak thermal points or thermal bridges.

Also, permission to translate and publish in French, Dr. B. L. Collin's Building Science Series No. 70, Windows and People: A Literature Survey, Psychological Reaction to Environments With and Without Windows, was extended by NBS to CSTB in Winter 1975. This was promptly and attractively issued by CSTB in Spring 1976. The report also will be translated into Italian for publication by the Associazione Italiana Prefabbricazione in Milan.

BUILDING RESEARCH ESTABLISHMENT JOINT CENTER FOR BUILDING TECHNOLOGY
COMPLEMENTARY RESEARCH PROGRAM

Building Research Establishment
Garston, Watford, WD2 7JR
UNITED KINGDOM

This program was initiated in response to the 1971 Memorandum of Understanding between Mr. George Romney, Secretary of US Department of Housing and Urban Development and Mr. Peter Walker, Secretary of State, UK Department of Environment. During FY 75 and FY 76, CBT has been involved in four complementary projects; wind loads on buildings, design of water supply and drainage installations, heat pump systems, and energy conservation in lighting.

Wind Loads on Buildings

For the past three years, the Building Research Establishment (BRE), and the Center for Building Technology have carried on a joint complementary research program in the area of wind loads on buildings and structures under the provisions of a memorandum of understanding agreed to by the Department of the Environment (UK) and the Department of Housing and Urban Development (US). Both laboratories have realized substantial benefits from this collaborative effort which was officially completed on June 30, 1975.

The major accomplishments, some of which have already been applied to the updating of design data and procedures, are: (a) development of improved instrumentation and experimental techniques for the measurement of wind pressures of building and structures; (b) comparison of methods for the analysis of random data and the adoption of a standard format for the presentation of test results; (c) sharing of full-scale test results obtained under strong-wind conditions having a low probability of occurrence; (d) successful measurement of tall-building accelerations and displacement and comparison with theoretical

predictions of response; and (e) exchanges of information on the wind tunnel simulation of atmospheric surface flows and modeling of low-rise buildings.

There are still many uncertainties which exist in the design of low-rise buildings to better resist wind forces. In particular, the collaboration to date has been concerned almost entirely with full-scale measurements on low-rise domestic buildings. It has been recognized that both full-scale and wind-tunnel studies also are needed on other low-rise buildings such as industrial buildings and mobile homes.

Two new activities commenced in FY 76: (a) Wind Loads on Low-Rise Buildings and (b) Wind Response of High-Rise Buildings. The first activity--wind loads on low-rise buildings--is concerned with the following activities.

1. Full-scale instrumentation and experimental techniques
2. Wind-tunnel simulation of atmospheric flows
3. Wind pressure data in both model and full-scale
4. Data reduction and analysis
5. Draft design criteria for wind loading

Items 1, 3, and 4 are a continuation of past exchanges, while items 2 and 5 represent new areas of collaboration. The BRE boundary layer wind tunnel is new. NBS-funded work is in progress at the Virginia Polytechnic Institute and State University (VPI-SU) to model low-rise buildings in a wind tunnel. The BRE wind tunnel research and the VPI-SU modeling will greatly enhance data analysis of the full-scale data taken by BRE at the test house in Aylesbury, England and by NBS at six houses located at three Philippine field test sites. BRE and NBS are in the early stages of developing revised criteria for wind loads on low-rise buildings and can thus derive substantial benefits from this collaborative effort.

This project was initiated on July 1, 1975 and will be reviewed on September 30, 1976 for revision. It is expected that the project will be completed by September 30, 1977.

The second activity, Wind Response on High-Rise Buildings, is concerned with using an optical device for measuring building deflections. The device was developed at NBS and, under the existing collaborative agreement between NBS and BRE, was loaned to BRE for use in their full-scale measurements of building response. After technical exchanges took place between the two organizations, improvements were made to the optical device out of the experience gained in its use at the Post Office Tower, London. During April-June 1975, Dr. Peter Sparks from BRE worked at NBS analyzing recordings of structural response to wind obtained in the UK and comparing these responses with those predicted by methods developed by Dr. Emil Simiu at CBT.

In this activity the full-scale measurements of building response to wind will continue at BRE, providing further information about the dynamic characteristics of buildings and the wind loads acting upon them. By continuing to work closely together, the two organizations will pool their resources in this research area.

The principal tasks and responsibilities associated with this activity are:

1. Development of instrumentation for the full-scale measurement of building response (BRE/NBS)
2. Measurement and analysis of records of the response of a number of different types of high-rise buildings to wind and mechanically induced loading (mainly by BRE) and
3. Development of theoretical methods of predicting dynamic response of tall buildings to wind loading (mainly by NBS).

The results of this work, a better understanding of the dynamic behavior of tall buildings and improvements in the design methods of predicting building response in wind loading, should be readily applicable in the USA and the UK.

This project was initiated on July 1, 1975 and will be reviewed on September 30, 1976 for continuation or revision. It is expected that the project will be completed by September 30, 1977.

Design of Water Supply and Drainage Installations in Buildings

The cooperative program began on July 1, 1972 and was divided into three program elements: plumbing and drainage, vacuum drainage, and water demand load data.

In the first, a sound method is required for the design of conventional drainage systems in buildings and both BRE and CBT have worked on this subject. A computer program is available at BRE for sizing drainage and vent stacks on traditional as well as single stack systems (the latter are simplified systems that are now beginning to win application in the USA). BRE has welcomed the chance to gain further field data for comparison with its computer program predictions and NBS received a copy of their computer program for design use. Adaptation for US conditions requires attention to 1) pressure loss factors appropriate to US fittings, and 2) flow rates appropriate to US fixtures.

Discussion with Cyril Webster, a Professional and Technical Officer of the BRE staff, during his visit to NBS in April and December 1975 concerned current research activities associated with the above and future activities on horizontal drainage and solid waste studies. In FY 1976, BRE was provided with data analysis and reports on this activity.

In the second element, both BRE and CBT have an interest in new drainage systems that are coming on the market, especially in respect to health and safety requirements, water economy, and economics. BRE has conducted some drainage tests; and CBT, under a Department of Defense, Tri-Services sponsored project, developed criteria for the evaluation of vacuum drainage systems. In June 1975, a copy of "Review of Vacuum Drainage Systems," by David Mitchell, Building Services Section, CBT, was sent to BRE for their comments and information.

In the third, water demand load data, a sound theoretical framework as well as adequate field data are required for the specification of plumbing systems design loads and storage requirements. Current methods are not rigorous and are known to lead to over-design. BRE has developed a theoretical basis for improved design load estimation. CBT has completed the installation of field measurement instruments and procedures for the evaluation of field data at Twin Rivers, N. J., and at Andrews Air Force Base, Maryland. Interpretive data reports are being compiled and will be provided to BRE. It is expected that even though the UK and the US have somewhat different activity patterns, a common theoretical framework may emerge for demand estimation.

Mr. Per Bakke, Assistant Director, BRE, conferred with Dr. L. Galowin, Chief, Building Services Section, CBT, during his tour of CBT in December 1975. Dr. Galowin and R. Wyly, Plumbing Research Engineer, Building Services Section, CBT, also conferred with BRE staff during their visit to BRE in September 1975 about the ongoing joint work. Agreement was reached that the joint work is progressing satisfactorily toward the targeted objectives.

Heat Pump Systems

A two year joint agreement was signed on April 15 and May 5, 1975 by BRE and NBS to exchange research on heat pumps. As a brief background to this agreement, it is known that heat pumps have high effective coefficients of performance -- from 1.5 to 3.0 under steady-state operation as compared with 0.3 for electric resistance heating and 0.65 to 0.8 for gas and oil fired furnaces. The different utility circumstances, climate and building design dictate significant distinctions between heat pump research program emphases in the UK and the US. Together, however, comprehensiveness can be achieved with benefits for both countries. For example, investigations of heating-only applications of heat pumps, warranted in the UK but difficult to justify in the US, nonetheless could benefit sections of the US.

CBT submitted preliminary results of 3 to 5 ton electric heat pump measurements taken in the summer of 1975. Other information was disseminated through the Winter of 1976. BRE submitted performance measurements of an electric heat pump during the summer of 1975. More information will follow through the fall of 1976.

Lighting Energy Conservation

A two year joint agreement commencing in late FY 75 focuses on the evaluation of illumination standards. This rests on two generally accepted criteria, one based on visual task performance and the other on "agreeableness." The CBT program in lighting is primarily a laboratory based activity emphasizing visual task performance, while the BRE program centers on field investigations and scale modeling studies with emphasis on agreeableness. A well-rounded program should contains elements of both since it is beneficial to make the transition from the laboratory (with its control of extraneous variables at the cost of realism) to the field, which has the opposite characteristics. Thus research efforts in this area are high complementary.

Dr. Gary Yonemura, Sensory Environment Section, CBT, visited Messrs. Collins and Crisp, Scientific Officers of the BRE staff, on September 26, 1975 to discuss specific areas involved in the lighting energy conservation project. Dr. Yonemura sent the results of the alpha-numeric component of CBT's visual illumination research which was completed in the winter of 1975. BRE will train their staff to duplicate this study. The BRE unit responsible for this project is in the process of training new staff in the wake of a recent reorganization. Mr. Collins will suggest new milestone data. Dr. A. I. Rubin, Chief, Sensory Environment Section, and his staff frequently correspond with counterpart staff of BRE and are transferring data on a continuous basis. The end product will be a research report based on a joint development of standard measurement procedures to assess quality of office lighting. It is estimated to be completed in late 1977.

JOINT US/EGYPTIAN COOPERATIVE PROGRAM ON BUILDING MATERIAL AND
TECHNOLOGY

Faculty of Engineering
Cairo University
Giza, Egypt

In June 1974, the Joint US/Egyptian Cooperative Commission was established by the Presidents of both countries. It is headed by the US Secretary of State and the Egyptian Minister of Foreign Affairs. The Joint Commission created six different Joint Working Groups, and NBS was asked to participate in the one addressed to Technology, Research and Development. Their task was to prepare concrete projects and proposals that will encourage exchanges and joint research in the scientific and technical field for the purpose of promoting better mutual understanding of each other's institutions, purposes and objectives.

In Cairo during November 1974 the Working Group developed five topic areas: Building Materials and Technology; Repair and Maintenance of Laboratory Equipment; Water Resources Management and Treatment, including Disalination, in Relation to Agriculture; Information Systems; and Lake Nasser Water Problems.

CBT initiated various research projects in the area of Building Materials and Building Technology. Included were short and long term projects under four major groups of activities. These encompass and use the recommendations and the 29 proposed projects described in a preliminary report of March 1975. The four major groups are: Education and Training, Building Materials, Building Methods and Techniques, Building Information Services.

In February 1976, to ascertain their timeliness for funding under AID's Manpower and Development Program, the proposed 29 projects were redefined to 19 projects to reduce subject overlap.

Because of the emerging urgency and usefulness of one particular project, a Building Information Program, both countries advanced \$20,000 each (the US share was funded under an NBS Special Foreign Currency Program Grant) and project work was initiated. Located at Cairo University, the information program is intended to enhance and strengthen those existing building information activities currently in operation in Egypt, and to address the Egyptian's user's needs for information in context with the Egyptian building community.

The US/Egyptian working group coordinators are: J. L. Haecker, Institute for Applied Technology, NBS, and Dr. Ahmed A. El-Erian, Professor, Faculty of Engineering, Cairo.

Public Works Research Institute
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Tokyo, Japan

This panel is one of the twenty panels in the US-Japan Cooperative Program in Natural Resources (UJNR). The UJNR was established in 1964 by the US-Japan Cabinet-level Committee on Trade and Economic Affairs. Its purpose is to exchange scientific and technological information which will be mutually beneficial to the economy and welfare of both countries. The purpose of the annual joint meeting of this panel is to exchange technical information on the latest research and development activities within governmental agencies of both countries in the area of wind and seismic effects.

The Seventh Joint Meeting of the US-Japan Panel on Wind and Seismic Effects was held in Tokyo, Japan on May 20-23, 1975. The exchanges dealt with extreme winds in structural design; assessment and experimental techniques for measuring wind loads; dynamics of soil structures and ground response in earthquakes; structural response to wind and earthquake design criteria; disaster mitigation against natural hazards; and technological assistance in developing countries.

The Eighth Joint Meeting of the Panel met in Washington, D.C. on May 18-21, 1976. The topics included wind effects on structures; extreme winds for structural design; ground motions and instrumentation; seismicity and earthquake risk; lessons learned from recent natural disasters; seismic effects on structures; design of nuclear reactor facilities; and a special session on the Guatemala earthquake.

Proceedings of these panel meetings will be printed separately as a National Bureau of Standards Special Publication. As in the Special Publication, No. 444 for the Sixth Meeting entitled Wind and Seismic Effects, these will include the opening remarks, the program, the formal resolutions, and the technical papers. The Ninth Joint Meeting is scheduled to be held in Tokyo, Japan in May 1977.

NATO-CCMS Headquarters
Brussels, Belgium

The Committee on the Challenges of Modern Society (CCMS) was established in 1969 by the North Atlantic Treaty Organization (NATO) to promote the effective and continuing exchange of information, technology and experience among its members to create a better environment. In May 1974 the pilot study, "Rational Use of Energy," and its sub-project, "Modular Integrated Utility and Total Energy Systems," known as the CCMS-MIUS Project, were established.

Both the pilot study and the sub-project are led by the US. The CCMS-MIUS Project was established because of international concern over the need to provide more utility services to communities while improving energy utilization and the environment. The US Department of State assigned the lead role responsibility of the CCMS-MIUS Project to the US Department of Housing and Urban Development (HUD) which sponsors the HUD-MIUS Program.

The National Bureau of Standards is supporting HUD by representing the US in the CCMS-MIUS Project. This includes committee participation, developing the technical reporting system, administrative and technical leadership, and supply technical data from the HUD-MIUS Program demonstration.

The first meeting of the CCMS-MIUS Project was held April 1975 at NATO-CCMS Headquarters in Brussels. C. W. Phillips of CBT, Manager of the NBS/HUD-MIUS team chaired the meeting. The US agreed to prepare a draft glossary of terms unique to integrated utility systems, a draft standard methodology for reporting information on projects, standard data units, and a format sheet to describe on-going and planned projects for which data is to be made available to the other participants of the committee, at the next meeting.

During the second meeting in December, 1975, at the laboratories of the Netherlands Organization for Applied Science Research (TNO) in Appeldoorn, the Netherlands, twenty-six experts from eight countries

attended. The countries represented were Belgium, France, the Federal Republic of Germany, Italy, the Netherlands, Sweden, United Kingdom, and the US. Approval to complete and issue the CCMS-MIUS glossary at the third meeting was obtained. A discussion was held on the purposes, data forms and the procedures for developing a "Project Catalog" of on-going and planned CCMS-MIUS related projects. A discussion was also held on the means to develop a uniform methodology to measure and report the performance of the various projects. This methodology offers as guidelines: (a) specific measurements, (b) when and how they should be made, (c) new measurement techniques not now commonly known or used, (d) how the data should be presented, (e) how much data is appropriate, (f) characteristics of a system that must be known for evaluating performance and (g) calculation necessary for arriving at performance characteristics.

Two committees were established to develop the "Project Catalog" and the uniform methodology for measuring the reporting performance. A Data Format Committee charged with the responsibility to produce and maintain the "Project Catalog," and the Project Progress/Evaluation Report forms was established with the US taking the lead role. Also established was the Measurement Technology Committee, which has the responsibility of developing a uniform methodology for measuring performance.

The third meeting was held at Electricite de France, Centre des Renardieres, on May 18-19, 1976. The third meeting resulted in a review and approval of a work program which was developed by the membership. The three working committees on data format, measurement technology, and research needs developed specific goals and timetables.

The Data Format Committee, whose purpose is to obtain the necessary data needed to produce the Project Catalog, was chaired by the US.

The Measurement Technology Committee was chaired by the Netherlands who agreed to establish a task force of the committee members from the Netherlands, the Federal Republic of Germany, France, and Sweden to complete the measurement methodology.

The Research Needs Committee, established under the chairmanship of Belgium, will compile a list of research and development needs related to MIUS and Total Energy Systems which will be ranked in terms of priority, and will present the list for discussion at the next meeting.

The US has begun the design of a complete MIUS demonstration plant which integrates all five utility systems and services. Within two years this plan is expected to be producing data for evaluation. Several other participants are either experimenting with or already incinerating solid waste for the production of steam and electricity.

Briefings to update all the projects will be made at the next meeting in Europe, which is scheduled for December 1976.

CENTER FOR BUILDING TECHNOLOGY/INSTITUTO DE PESQUISAS TECNOLOGICA (IPT)
BRAZIL COLLABORATIVE BUILDING TECHNOLOGY PROGRAM

Instituto de Pesquisas Technologica
Sao Paulo, Brazil

The Center for Building Technology is providing advice and assistance to increase the technical capabilities of a first staff member from Brazil in building technology. This initiative is part of the NBS/IPT Collaborative Program under the US-Brazil Joint Group on Science and Technology Memorandum of Understanding. Ricardo Florez of the Instituto de Pesquisas Technologica (IPT), Sao Paulo, is in training at CBT for a two-year period which started in Spring of 1975. Building technology aspects of all CBT programs were included in this training and Mr. Florez will participate in specific projects which have mutual benefits to both institutions.

Emphasis in the training is being placed upon learning the methodology and techniques for developing performance standards. During the first portion of the training period which lasted approximately nine months, Mr. Florez participated on a rotating basis in numerous programs within CBT. His assignments included activities in the Office of Housing and Building Technology, the Structures Section, the Materials and Composites Section, the Architectural Research Section and the Office of Building Standards and Codes Services. He has had an intermittent exposure to the activities of the other units of CBT.

As a result of an identified need by IPT which parallels a current program within CBT, a specific task has been identified for Mr. Florez to actively participate in during the first half of FY 77. IPT is interested in developing standards for the performance of windows since CBT has a program on window performance relative to energy conservation this project provides an opportunity to expand the scope of an ongoing activity to include parameters of window performance which will address the needs of both CBT and IPT. Activity in this area also responds to the request by the Superintendent of IPT that the training program include a joint project on improved building performance standards or development of test methods.

The project will be directed toward the collection of information to determine the state-of-the-art and to present in performance terms those attributes of window assemblies which are of major importance. Methods of evaluation will also be identified which can be used to determine achievement of performance for the individual attributes.

US-USSR JOINT COMMITTEE ON COOPERATION IN THE FIELD OF HOUSING AND
OTHER CONSTRUCTION

Department of Housing and Urban Development
Washington, D.C. 20410

The US-USSR Agreement on Cooperation in the Field of Housing and other Construction was signed in Moscow on June 28, 1974. The purpose of the Agreement is to facilitate information transfer between the US and USSR. Six areas for joint research and information exchange were identified: building materials and components; building design and construction management; industrialized building systems and utilities; construction in seismic areas; building for extreme climates and unusual geological conditions; and new towns.

Following this agreement, a Memorandum of Implementation was signed on June 18, 1975 by the Secretary, US Department of Housing and Urban Development and the Deputy Chairman of the Council of Ministers of the USSR and Chairman of the State Committee of the USSR Council of Ministers for Construction Affairs (Gostroy, USSR). The Memorandum of Implementation formally established six working groups, one for each of the above areas. CBT has been involved in two working groups, the "Building Materials and Components" and the "Building Design and Construction Management."

The first meeting of the working group on Building Materials and Components was held in Moscow on April 11-22, 1976. The US Delegation was headed by Dr. E. O. Pfrang, Chief, Structures, Materials and Safety Division, CBT.

Various presentations were made during the Moscow meeting. Topics included US and USSR building activities and accomplishments in scientific research, development, organization of production and application of new and effective building materials and components. Future cooperation with the USSR involving this working group includes fiber reinforced and polymer concrete, asbestos-cement, concrete and concrete products, glue-laminate wood structures, mineral fibers and testing methods for building materials and elements.

The delegation agreed to future meetings on the subject of Fire Prevention and Control Problems. Also, it was agreed that small groups of specialists study specific questions of mutual interest. These visits from each side would be for a duration of no more than three months. A second meeting to be held in Washington, D.C. was prepared for the summer of 1977.

The working group on Building Design and Construction Management is headed by Tom L. Peyton, Jr. of the Public Building Services, General Services Administration. Dr. Richard N. Wright, Director, CBT, and Mr. Harry Thompson, Acting Chief, Office of Housing and Building Technology, CBT, participated as members of the US-USSR working group during the Soviet visit to Washington, D.C. March 30 to April 3, 1976.

The working group agreed to: exchange standards, technical and research documents on building design and construction management; exchange specialists and delegations in project areas to be agreed upon in the future; and to organize joint symposia, conferences and seminars of mutual interest to the US and USSR. The next meeting was tentatively scheduled for the Spring of 1977 in Moscow.

INTERNATIONAL BUILDING RESEARCH PROJECTS

WIND LOADS ON LOW-RISE BUILDINGS

The Center for Building Technology (CBT) under an Agency for International Development (AID) sponsored project is developing improved wind load design criteria for low-rise buildings in developing countries to better withstand the effects of extreme winds.

This project began in 1973 with the recognition by AID and CBT that additional research on wind was needed to reduce human suffering, property losses, disruptions to productive activities, and expenditures for disaster relief. The objectives are to: 1) learn more about the effects of high winds on low-rise buildings; 2) develop improved siting, design, and construction information, which would improve the resistance of buildings to extreme winds and which would be culturally acceptable to the user; 3) provide training to local professionals and technicians in performing wind measurement and analysis of full-scale and wind-tunnel testing; and 4) provide a large-scale transfer of technology to make use of these improvements in design and construction, as well as new climatological, sociological and economic findings.

Accomplishments associated with the project have produced the following benefits: 1) improved design criteria; 2) increased awareness of the need for improved ways to design against effects of extreme winds and on the methods required to improve building designs; 3) essential documentation of new and under-used existing information; 4) established working relationships with public and private decision makers in several developing countries and continued excellent working relationships with building professionals in developed countries; 5) training professionals and technicians in developing countries for carrying out wind measurement and analysis procedures; and 6) developed methods to transfer information to users in developing countries.

Project results are discussed in more detail in the National Bureau of Standards Interagency Report NBSIR 75-790, FY 75 Progress Report on Design Criteria and Methodology for Construction of Low-Rise Buildings to Better Resist Typhoons and Hurricanes. The results were previously discussed at two regional conferences; one in Manila, Philippines (May 1975) and the other in Kingston, Jamaica (November 1975). These conferences provided a channel to transfer results to the building community, including government agencies, private developers, design professionals, regulatory officials, and university staff from Asian and Caribbean wind-prone countries. The conference provided an opportunity for the participating countries to comment on the design criteria and to offer suggestions for their implementation. Members from developing countries were provided an opportunity to better understand wind and building design problems common to their countries and discuss methods for solutions.

The results of these efforts are significant. These activities provided the first step toward the preparation of improved wind codes and standards for developing countries. The Philippine National Code is currently undergoing revision that will lead to improved building practices. The project's test data, including improved gust factors and mean pressure coefficients, are being incorporated into Section 2.05, "Wind Pressures," of the National Structural Code for Buildings. Also, the projects test results will be made available to the subcommittee on wind loads of the American National Standards Institute, Inc. (ANSI) for possible incorporation into the American National Standard A58.1-- "Minimum Design Loads for Buildings and Other Structures."

SPECIAL FOREIGN CURRENCY PROGRAM

In the course of its overseas operations, the United States acquired foreign currencies. These are kept in US Treasury Department accounts for use by Government agencies to finance overseas projects of scientific or technological usefulness to both the US and to the participating countries.

During the past few years, this program has become less active and is gradually being replaced by bi-national science projects with each country sharing in the funding of the work mutually undertaken. Some Special Foreign Currency Program projects are continuing on grants previously made. A description of these SFCP grants, with which the Center for Building Technology (CBT) was involved in FY 75 and FY 76 is given below.

Grant 100 - Title: Water Conservation Measures in Plumbing

Scope: The aim of this project is to determine performance of sanitary plumbing equipment or systems designed to reduce water consumption through measures such as high-efficiency sanitary fixtures and flow regulating devices. It is intended also to carry out observations and tests on recirculating sanitary waste-disposal systems and on the "Vacuum Sewerage System" in order to ascertain whether efficient oxidation of organic waste products is feasible with small consumption of water.

Principal Investigator: Professor H. Ilberg

Institute: Standards Institution of Israel, Tel Aviv, ISRAEL

CBT Monitor: Mr. R. S. Wyly, Building Services Systems Section, CBT

Signed: March 24, 1970

Status: Sixth and final report published December 1975. A CBT publication abstracting and digesting the results most applicable to US practices will be issued in the second half of FY 1977.

Grant 109 - Title: New Developments, Directions and Innovations in
Buildings and Building Research in Israel

Scope: A factual exposition and up-to-date technical and economical evaluation of Israeli experience and research in building construction activity; which includes comparative analysis of building costs in various types of industrial buildings; industrialized systems in school-building; open systems using light-weight materials; and developments in modular coordination.

Principal Investigator: Mr. A. Alweyl

Institute: Standards Institution of Israel, Tel Aviv, Israel

CBT Monitor: Mr. P. R. Achenbach, Building Environment Division, CBT

Signed: March 17, 1970

Status: Final Report published May 1975.

The above are a few examples of the useful mutual benefits gained through the projects made possible by the availability of P.L 480 Special Foreign Currency Program Funding, which began at NBS in 1961 and now is almost completely phased out. New initiatives to continue such work are being explored.

For example, as a result of the encouragement of the US/Israel Binational Science Foundation Program, Asher Alweyl of the Standards Institution of Israel in Tel Aviv and Noel Raufaste of CBT are currently investigating research areas which contribute to building technology that may have a contributory impact on CBT's and the Standards Institution of Israel's cooperative research programs.

US - POLISH PROJECT PROPOSALS IN HOUSING AND BUILDING MATERIALS

In the Spring of FY 76 the Government of Poland appropriated local funds for cooperative research in housing and building materials. The funds are not convertible to dollars except for travel and per diem for Polish scientists to the United States. Following this development, the Center for Building Technology developed several proposals for projects in which Polish contributions to building technology would be of parallel interest to ongoing CBT programs.

Among these are: 1) a district heating in cities project to survey the development of integrated utility systems, including district heating and dual-purpose heat/electric power generation in Poland. This activity would be directly related to the North Atlantic Treaty Organization's Committee on the Challenges of Modern Society-Modular Integrated Utility System (CCMS-MIUS) project (the extensive Polish experience in large-scale district heating of cities using advanced heat/power generation and heat distribution techniques provides a strong base for conducting research in this area); 2) a project in the reactivity of slags in portland blast furnace slag cements; 3) fundamental studies of the effects of cleaning materials and processes on the durability of surfaces of stone buildings; 4) techniques for the non-destructive evaluation of concrete; 5) and a proposal to cooperatively study the mechanical and thermal properties of foamed concrete.

Thermal proposals are currently under consideration for future CBT/Polish cooperation.

INTERNATIONAL DISASTER MITIGATION/RESEARCH ASSISTANCE

CBT, actively involved in developing improved design criteria, guidelines and recommendations to improve building practices, continues to receive, and to respond to, requests for assistance in coping with natural disasters. The following five NBS publications, available to the building community, suggest the nature of this work:

Development of Improved Design Criteria for Low-Rise Buildings in Developing Countries to Better Resist the Effects of Extreme Winds, BSS-56. October 1974. Superintendent of Documents Catalog #13.29/2;25, U.S. Government Printing Office, Washington, D.C. 20402.

These are the proceedings of a workshop held in the Philippines November 1973 to assess the state-of-the-art of wind technology in developing countries. It was sponsored by the Agency for International Development, US Department of State.

Design Criteria and Methodology for Construction of Low-Rise Buildings to Better Resist Typhoons and Hurricanes. NBSIR 74-567 and NBSIR 75-790. NTIS #'s COM 74-11631 and PB 250-848/9WB respectively, National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22161.

These progress reports prepared for the Agency for International Development (AID) discuss the principal CBT activities and accomplishments during FY 74 and FY 75 toward the development of improved design criteria for low-rise buildings to better resist the effects of extreme winds. The project centered in the Philippines with strong contributions from Bangladesh and Jamaica. The reports cover instrumenting test houses, training technical personnel at the test sites, wind tunnel testing activities, analyzing wind load data, an international workshop and technology transfer at a regional conference.

A Technical Review of the Nicaraguan Regulatory System, Tech. Note 885. October 1975. Superintendent of Documents Catalog #C13.46:885, U.S. Government Printing Office, Washington, D.C. 20402.

Also prepared at the request of AID, as well as the Organization of American States, as a means of assisting in the implementation of up-to-date provisions of earthquake resistant design and construction, the usefulness of which was underscored by the Managua earthquake of December 1972.

Engineering Aspects of Cyclone Tracy, Darwin, Australia, 1974, BSS-86. June 1976. Superintendent of Documents Catalog #C13.29/2:86, U.S. Government Printing Office, Washington, D.C. 20402.

This report resulted from the invitation by the Australian Government to CBT's Dr. R. D. Marshall, Structural Research Engineer, to inspect the cyclone damage in Darwin, Australia, and to participate in discussions of new design criteria and construction practices for cyclone areas.

Following the May 6, 1976, earthquake in Italy, AID, the National Science Foundation, the US Geological Survey, and the NBS developed an assistance plan which Vice President Nelson Rockefeller discussed with the Italian Government on his May 21st visit to that country. The plan included technical recommendations by CBT Disaster Research Coordinator, Dr. Charles Culver.

After the Vice President's visit to Italy, AID requested additional NBS assistance in carrying out the plan. NBS selected CBT's Dr. Emil Simiu, Structural Research Engineer, who was detailed to Italy to add structural engineering expertise to a seven-member US multi-disciplinary team.

Information gained from the post-disaster investigation will provide the Italian government with immediate on-site technical assistance and information that will contribute to improved building practices.

PHILIPPINES SURVEY ON STANDARDIZATION AND MEASUREMENT SERVICES IN BUILDING TECHNOLOGY

Office of Science and Technology
Agency for International Development
Department of State
Washington, D.C. 20523

During May 4-17, 1975, NBS's Office of International Relations coordinated a survey of standardization and measurement services in the Philippines. One component of this survey addressed the state-of-the-art of Philippine building technology. Over two dozen private and public building organizations in the Philippine community were visited. This survey is part of an NBS continuing program (to survey selected developing countries) sponsored by the Office of Science and Technology of the Agency for International Development (AID) to utilize the industrial technology capability of the National Bureau of Standards.

Results of the survey have been published and are available as NBSIR 76-1083, Report to AID on the Philippines Survey on Standardization and Measurement Services.

Dr. Zae-Quan Kim, Director
Korean Standards Research Institute
Seoul, KOREA

At the request of the Agency for International Development, Mr. Philip Chen, Building Economics Section, CBT furnished technical assistance which included the review of reports, specifications, and working drawings with principal KSRI officials both at NBS and in Korea. Mr. Chen traveled to Korea in October 1975 to furnish consultative assistance in site planning, design and construction of a new Standards Research Institute Facility located southeast of Seoul.

Dr. Kim Yung Man, architect of the new Institute, and President of the Korean Institute for Urban Development made a return visit to the NBS in February 1976. At this visit CBT provided further technical assistance for the design and construction of KSRI's facilities.

Mr. Paul R. Achenbach, Chief, Building Environment Division, Center for Building Technology will provide consultation to the Korean Standards Research Institution staff in July 1976. Consultation includes the environmental conditions to be maintained in various laboratories, mechanical systems to be installed to control environmental conditions and design opportunities to be considered for conserving energy in operating the laboratories.

CROWD MOVEMENT RESEARCH

Division of Building Research
National Research Council
Ottawa, Canada

The Center for Building Technology (CBT) is collaborating with the Division of Building Research (DBR) of Canada's National Research Council in a study of crowd movement during the XXI Olympiad in Montreal, July 1976. Using videotape and film, the DBR-CBT team will record the flows of large groups of spectators as they move into, out of, and around the Olympic Stadium and other facilities constructed for the Games. These records will then be analyzed to identify the performance of various architectural systems with respect to rates of egress from the different arenas, the flow of crowds to and from adjacent transport facilities, and pedestrian movement on aisle-stairs and escalators.

The recording of architectural and pedestrian congestion over a prolonged, sixteen day period will provide a singular opportunity to acquire a stable data base on building performance under peak use conditions. Interestingly, these seldom observed peak occupancies are precisely the ones which all places of public assembly must be designed to accommodate.

John Archea, Research Psychologist, Architectural Research Section, CBT is heading the US team. In June he joined the DBR team in Montreal to observe the first public use of the Olympic facilities. From observations, counts, and measurements made during that visit, the DBR-CBT researchers were able to identify several critical situations suitable for study during the Games and to outline preliminary research plans. Following preliminary analysis of the data, a general report on the Olympic study will be issued jointly by CBT and DBR. As data analysis proceeds further, more technical reports on the specific relationships between building performance and pedestrian movement will be published.

CIB ACTIVITIES

Conseil International du Batiment pour la Recherche l'Etude et la Documentation (CIB)
Postbus 229, Weena 700
Rotterdam, NETHERLANDS

The International Council for Building Research Studies, and Documentation (CIB) was established in 1953 in response to recommendation made by the United Nations Economic Commission for Europe. CIB's major objective is to encourage and stimulate international cooperation in the gathering, refinement, and dissemination of building research information. These mutual exchanges facilitate the development and adoption of building standardization practices which in turn provide for the effective sharing of building research data and interchangeability of products on the international level. Fifty countries are currently members of CIB and send delegates from building-oriented organizations to participate in various CIB activities. Each full member country appoints representative to the CIB General Assembly which meets at least once every three years and in which the authority of CIB is vested.

USNCCIB ACTIVITIES

United States National Committee for CIB (USNCCIB)
National Academy of Science
Washington, D.C. 20418

In 1962, under the aegis of the National Academy of Science, the United States National Committee for the International Council for Building Research, Studies and Documentation (USNCCIB) was organized to represent the United States in the International Council for Building Research, Studies and Documentation (CIB). Since that time the USNCCIB has been a full member of the CIB.

The primary objectives of the USNCCIB are to: 1) Serve as a liaison between US interests and the CIB and, thus, provide a mechanism through which the ready exchange of building research data generated by US private and public organizations and other CIB members is encouraged; 2) Stimulate, through the establishment of counterpart commissions

and other working groups, the generation of research studies and information on the state-of-the-art in the field of building research and technology; and 3) Motivate organizations to take positive action in furthering building research studies and documentation and improving practice.

The membership of the USNCCIB is comprised of both Participating Organizations--private nonprofit national organizations and federal agencies conducting, sponsoring, administering, or utilizing building-related research studies and documentation--and Members-at-Large--individuals appointed in recognition of their competence in building research and related activities without regard to their organization affiliations.

One Institute for Applied Technology staff member, Mr. J. L. Haecker, continued a second term as the National Bureau of Standards Representative to USNCCIB, and as a member of the Executive Committee during the 1975 fiscal year.

Contracts or grants from various organizations provide the financial support for the USNCCIB. Funds were received from the National Science Foundation, the Department of Housing and Urban Development, the Department of the Army Construction Engineering Research Laboratory, the Department of Health, Education, and Welfare, and, jointly, from the Department of Commerce, National Bureau of Standards and the Department of Agriculture, Forest Products Laboratory.

The full USNCCIB Committee met on January 14, 1975 to review and provide guidance for the ongoing USNCCIB programs. The Executive Committee met on January 13, 1975 to review and advise on USNCCIB membership changes to be made for the 1975-76 fiscal year and to discuss financial support needs for the continuing USNCCIB program.

The USNCCIB was represented at the 6th CIB Congress in Budapest, Hungary, October 3-19, 1974 by an official delegation consisting of the USNCCIB Chairman, USNCCIB Representative to CIB, USNCCIB Executive Secretary, and seven other delegates, all appointed by the Foreign Secretary of the National Academy of Sciences.

The number of participants in the USNCCIB Counterpart Commission (CPC) to CIB W-62, Water Supply and Drainage for Buildings, has increased to 21, and the group met in September and December 1974 and in March and May 1975. This CPC also was represented at the September 1974 meeting of CIB W-62 (held in Copenhagen) by its Chairman and two other participants. Twenty representatives from European countries participated in the meeting which focused on water supply, drainage, and contamination of drinking water from cadmium and lead fittings. Attention also was given the activities of the following CIB W-62 working groups:

1. experimental techniques in research on drainage systems,
2. standardized techniques for measuring water closet performance,
3. performance criteria for piping materials as a function of use,
4. and water demand.

CIB W-62 also accepted an invitation from USNCCIB to meet in the United States on September 30, 1976 and, in conjunction with this meeting, the CPC to W-62 is planning a two-day international symposium during the last week of September 1976. The symposium, "Research Needs in Water Supply and Drainage for Building," will be treated in four sessions: 1) Water Supply and Conservation for Buildings, 2) Waste Water Drainage Systems for Buildings, 3) Performance Concepts for Water Supply and Drainage Systems for Buildings, and 4) International Perspectives. The first three sessions will feature the presentation of seven position papers identifying research needs in the United States while the fourth session will be devoted to the presentation of invited papers by international specialists who will discuss research needs in other countries.

The USNCCIB Representative to CIB W-67, Energy Conservation in the Built Environment, attended the CIB W-67 meeting in Oslo, Norway, on February 11-12, 1975. The commission met again in the fall of 1975 and held a symposium on April 6-8, 1976 at the Building Research Establishment, Garston, Watford, England. Dr. Snell, Chief, Office of Energy Conservation, CBT attended the latter meeting.

The following CIB committees were represented by the Center for Building Technology (CBT) staff members during FY 75-76.

Establishment of rules for dimensional coordination of construction components and products and recommendations for their use.

C. T. Mahaffey, Office of Building Standards and Codes
Services, CBT

Mr. Mahaffey attended the 9th Plenary Session of the International Modular Group (IMG), October 28-31, 1974, at the Bouwcentrum in Rotterdam, Netherlands.

Mr. Mahaffey reports that at this meeting, Mr. Balch of Denmark introduced a draft paper jointly prepared with Mr. Harrison entitled "Geometry of Joints," intended for CIB publications and asked for comments. Many were offered and the discussion became deeply involved in the details of joints--both vertical and horizontal. Mr. Bergval of Sweden took the view that the IMG ought to stay with the development of general principles of joints relative to modular coordination leaving details of their application in specific instances to designers and/or component manufacturers. Mr. Blach agreed to revise his draft and present it at the next meeting.

Mr. Volbide of the Bouwcentrum explained a recently developed tartan shaped modular gride which was developed by his laboratory and Stichting Architecture Research (SAR). Applications of this gride to a production process were demonstrated the following day on the outskirts of Amsterdam at the famous Bruynzeel factory. This company is now embarked on developing and marketing a building system for supplying the interior of living sections of housing. Making use of the SAR tartan grid and the SAR philosophy of enabling the occupant to be able to have some control over the arrangement of interior of his home, Bruynzeel hopes to win system acceptance in the new housing market and renovation market.

R. J. Kapsch, Assistant Chief, Office of Building
Standards and Codes Services, CBT

Mr. Kapsch participated in the 10th Plenary Session of the IMG at Oslo, Norway, on September 24-26, 1975. The session was attended by 21 members from 12 countries. At this meeting the

groups discussed a draft of the "Principles of Modular Coordination and Application Rules," which is a publication to further develop an existing International Organization for Standardization document, "Condensed Principles of Modular Coordination," to assist the practical application of modular coordination.

The group accepted the final text of the "Geometry of Joints," which will be given to the CIB for publication.

Other topics discussed were: the selection of multiple, overlapping and/or tartan grids and their use for particular purposes as opposed to the use of simple incremental grids; systems of "supports and detachable units;" a paper on the fixing of components, (by "fixing," IMG is referring to connections between non-load bearing components between each other and to the main structure); the problem of vertical increments of size to be used in design; and the term "multi-module".

W-45: Human Requirements and Building Design

Development of a list of human requirements to aid in drafting unified building codes.

Dr. A. I. Rubin, Chief, Sensory Environment Section, CBT

Dr. B. L. Collins, Research Psychologist, Sensory Environment Section, CBT

Dr. Collins attended the W-45 Committee meeting of October 21-22, 1974, in London. She presented a talk on "Windowless Environments" to the colloquium on Perception of the External World.

W-60: Performance Concept in Building

Development of a conceptual framework for a performance approach to building as well as a terminology and a commentary of the

existing situation.

R. J. Kapsch, Assistant Chief, Office of Building
Standards and Codes Services

On October 20-22, 1975, Mr. Kapsch attended the 8th meeting of the CIB W-60 Commission at the Princes Risborough Laboratory, one of the Building Research Stations which comprise England's Building Research Establishment.

At this meeting, the membership: reviewed the performance and effect of temperature and humidity in building components; suggested revisions to the paper, "Guidelines for the Preparation of Performance Statements;" accepted the paper, "Mechanical Performance Criteria;" discussed setting appropriate scales of performance, weathertightness, hygrothermal properties, and a paper by Mr. Blachere, Scientific Counselor of the Centre Scientifique et Technique du Batiment, on Principles for the Harmonization of Building Laws and Regulations.

W-62: Water Supply and Drainage in Buildings

Research to develop standards for water supply and drainage facilities in buildings.

Dr. J. E. Snell, Chief, Office of Energy Conservation, CBT.

Dr. L. S. Galowin, Chief, Building Services Section, CBT

R. S. Wyly, Building Services Section, CBT

(Activities reported under the USNCCIB activities)

W-67: Energy Conservation in the Built Environment

Study of all aspects of energy in relation to buildings apart from energy usage in the product of building materials, and consideration of building designs to minimize heat loss and utilize solar energy, the consumption of service systems, and the optimalization of the use of primary energy sources.

H. R. Trechsel, Office of Energy Conservation, CBT

Dr. D. A. Didion, Chief, Mechanical Systems Section, CBT

Dr. J. E. Snell, Chief, Office of Energy Conservation, CBT

Mr. Trechsel participated in the October 8-9, 1975 meeting of W-67 at Stockholm Sweden. At the meeting reports were discussed

and accepted from related CIB Steering Groups on: climate definitions, and energy consumption requirements. Also discussed and accepted were a register of ongoing energy research within CIB, and a review of publications.

Dr. Didion participated in the first meeting of the Technical Sub-Group on Heat Pumps of W-67 which was held at the Building Research Station, Garston, England, on February 2-10, 1976. Specialists from 12 countries attended. In representing NBS, Dr. Didion was the only American and therefore tried to present the status of the American heat pump industry. The significance to this is that, at present, America is the only country with manufacturers of unitary heat pumps for both heating and cooling. The interest NBS has in the European work is the performance of heat pumps in Northern climates and, in particular, studies about "heating only" heat pump. It would of course be a non-reversing heat pump which would have higher performance for cheaper first cost. Such a device would be equally advantageous in the northern US.

The status of heat pump research in the participating countries is as follows. 1) Active research programs involving present day heat pumps in belief they can be adapted for their residential needs include England, France, Austria, Belgium, Northern Ireland, and the US. 2) Active research programs involving present day heat pumps in belief they are currently not economically sound for residences but may be in the future include Norway, Sweden, Denmark, Switzerland, and Eire. 3) Developing a new heat pump for own particular needs includes Germany.

Dr. Snell participated in the W-67 Symposium at Garston, Watford, England on April 6-8, 1976. The symposium was attended by nearly 200 delegates from 21 countries. A principal outcome of the meeting which followed the Symposium was a public "Statement On Energy and Buildings." This statement, the product of some considerable debate, reinforces CBT's energy conservation conclusions in the built environment.

Of particular note, the last paragraph of the statement was taken essentially intact from a paper, "Energy Conservation and Building Occupants," which Dr. Rubin of the CBT Sensory Environment Section prepared for the Symposium.

It reads as follows:

"We would view a short-sighted approach any headlong rush to building design which would conserve energy at the expense of the quality of buildings as judged by the occupants. In this respect an increased understanding is required of the environmental requirements for buildings. Building occupants and building operatives have an important role to play in energy conservation, but it is a role that is much less understood than other strategies for energy conservation. More needs to be known concerning how the performance of an occupied building can differ in operation from the intentions of its design. Much of the work reported so far leads us to emphasize the need for an integrated design team in the initial stages of building planning to enlist the co-operative efforts of the architect, the engineer, the building owner, and contractor, on the energy requirements and design aspects of a new building."

Dr. Rubin attended the 6th Congress of CIB in Budapest, Hungary, October 2-10, 1975, which has as its theme, "The Impact of Research on the Built Environment." Mr. Blachere, of the Centre Scientifique et Technique du Batiment (CSTB) and Chairman of CIB W-45, delivered a keynote address which emphasized the need for upgrading the empirical data base of human requirements in buildings rather than focusing on theoretical studies. He pointed out the importance of methodological investigations which can facilitate the collection of relevant data. Mr. Blachere called on all members of the CIB to assist W-45 on developing a meaningful of human requirements covering topics of: energy conservation, use of solar energy; indicating needs by building type (offices, schools, homes) as well as individual

characteristics of users/children, aged, handicapped, cultural background; and which consider social psychological requirements.

Dr. Richard N. Wright, Director, Center for Building Technology, attended the Research Managers Meeting of CIB in Bucharest, Romania on September 16-20, 1975.

Dr. Wright presented a paper on assessing the impacts of architectural and behavioral research. The principal points were that building researchers must assess the impact on their activities, and that this assessment requires the existence of an implementation program which will be an order to magnitude larger than the research itself.

The meeting closed with a discussion of the individual manager's biggest problems which included the need for effective communication with the building community (avoiding the walls which seem to grow up by themselves around the research institute and between the elements of the research institute), programming, long-range planning, responding to institutional demands, keeping research institutes creative, and keeping research staffs studying.

ISO ACTIVITIES

International Organization for Standardization (ISO)
1 Rue de Varembe
1211 Geneva 20, SWITZERLAND

The International Organization for Standardization (ISO) comprised in 1975 the national standards bodies of 81 countries. The work of ISO is aimed at world-wide agreement on International Standards for the purpose of the expansion of trade, the improvement of quality, the increase of productivity and the lowering of costs.

Technical work is carried out through technical committees(TC), the secretariats of which are distributed among the member countries. In order to better survey a broader field and to assess the needs for International Standards in a particular field, ISO may create technical divisions (TD), which in general oversee the work of the TC's. The technical committees may, in turn, create sub-committees (SC) and working groups (WG) to cover different aspects of the work.

An International Standard is the result of agreement between the member bodies of ISO. A first important step towards the International Standard takes the form of a draft proposal—a document circulated for comment within the technical committee.

The draft must pass through several stages before it can be accepted as an International Standard. This procedure is designed to ensure that the final result is acceptable to as many countries as possible.

When agreement is reached within the responsible technical committee, the document is sent to the Central Secretariat for registration as a draft International Standard (DIS); the DIS is then circulated to all member bodies for voting. If 75 percent of the votes cast are in

favor of the DIS, it is sent to ISO Council for final acceptance as an International Standard.

A number of the Center for Building Technology (CBT) staff participate in ISO technical committees, either through membership in ISO sub-committees and working groups, or by serving in a U.S. liaison function through ANSI.

TC 59: Building Construction

Standardization of: 1) Terminology in the construction and civil engineering industry; 2) General geometric requirements for buildings, building elements, components and products, including modular co-ordination and its basic principles, joints, tolerances, and fits; and 3) Other general performance requirements for buildings, building elements (user needs) including the co-ordination of these with performance requirements of building components and products to be used in the construction and civil engineering industry are excluded:

- Bases for design of structures (TC 98)
- Particular geometric requirements and performance requirements of building components and products which are in the scope of separate ISO technical committees.

C. T. Mahaffey, Building Standards Program Manager, Office of Building Standards and Codes Services, CBT

Mr. Mahaffey attended grouped meetings of TC 59, TC 98, and TD 3 in Stockholm on October 14-18, 1976. TC 59, Metrication, and the International Modular Group (IMG) of CIB are three seemingly separate activities which are closely related. TC 59 and the IMG are the international team responsible for all the dimensional coordination standards in use among the various industrialized nations. The link between dimensional coordination and metrication is demonstrated by the fact of Australia and Canada follow-

ing the British lead and are also typing dimensional coordination to their metrication efforts. TC 59 and the IMG activities therefore take on considerable significance to the US building industry as the US continues on the way into the use of SI units. The important action by TC 59 taken in the Stockholm meetings, to expand its operations to develop performance standards for buildings and building components further increases the significance of its activities to the US building community.

TC 80: Safety Color and Signs

Standardization and coordination in the field of safety colors and signs, including test methods for the colors, and in certain cases, the manner in, or device through which, the colors and signs should be displayed.

K. L. Kelly, Sensory Environment Section, CBT

A final draft of the ISO proposed standard, Safety Colors and Safety Signs, was circulated among the members, and it is anticipated that it will be voted upon and approved in 1976.

TC 86: Refrigeration

Standardization in the field of refrigeration, including cryogenics.

W. J. Mulroy, Thermal Engineering Section, CBT

There have been no meetings of this group for this period on which to report.

TC 98: Bases for Design of Structures

Standardization of the bases for design of structures irrespective of the material of construction including especially terminology and symbols, loads, forces and other actions and limitations of

deformations. Consideration and coordination of basic safety requirements concerning the structures as a whole, including considerations of structures made of particular materials (steel, stone, concrete, wood, etc). as far as is necessary for the preparation of common systems of safety, and in liaison with the relevant technical committees.

C. T. Mahaffey, Building Standards Program Manager, Office of Building Codes and Standards, CBT

Mr. Mahaffey attended the October 14-16, 1975 meeting which was held in Stockholm. TC 98, launched for the purpose of developing international standards for the bases for the design of structures, has attracted the attention of the foremost design professionals in each of many participating countries. Since one of the major design bases within the scope of TC 98 is safety, the resulting standards are of considerable interest to all government agencies concerned with public safety related to buildings.

TC 108: Mechanical Vibration and Shock

Standardization in the field of mechanical vibration and shock including: terminology; excitation by sources, such as machines, and vibration and shock testing devices; elimination, reduction and control, especially by balancing, isolation, and damping; evaluation of acceptable limits for man, and in machines, vehicles and structures; methods and means of measurement and calibration; and methods of testing.

DR. R. A. Crist, Chief, Structures Section, CBT

TD 3: Building/Construction

ISO Technical Divisions (TD's) are standards management type committees established for the purpose of meeting in an orderly fashion international standards needs in specific fields. There are, in 1976, four Technical Divisions (TD) which have been created to survey a broader technical field and to ensure a coherent planning and programming of the ISO technical work in cooperation with other international organizations. The other three deal with mechanical engineering, agriculture, and distribution of goods. Membership in technical divisions is open to interested member bodies as participating or observer members.

C. T. Mahaffey, Building Standards Program Manager, Office of Building Codes and Standards.

RILEM ACTIVITIES

Reunion Internationale des Laboratoires de'Essais et de Recherches sur
les Materiaux et les Constructions (RILEM)
12 Rue Brancion
75737 Paris CEDEX 15, FRANCE

RILEM is an international nonprofit association governed by Swiss Law. Its purpose is to facilitate contacts and exchange of scientific information among its members. Its aim is to constitute a medium of exchange and of communication of experience, essentially the experience acquired by the study of materials and building elements, by the observation of works, by tests in the laboratory and in situ, and by research without which none of these activities could progress. The 1975 RILEM membership list shows representatives from 70 different countries with a total membership of 679 persons. Recently RILEM has become more active in international standards organizations, particularly the International Organization for Standardization (ISO) and has adopted the policy whereby each technical committee must summarize its recommendations as prospective standards and submit them through the Permanent Committee of RILEM to ISO for international standards.

Dr. J. R. Wright, Deputy Director, Institute for Applied Technology, National Bureau of Standards, is beginning his second year of a four-year term as a member of the RILEM Bureau. The Bureau of RILEM corresponds to the Board of Directors of an organization such as the ASTM in the United States. Concurrently, he is beginning his second year of a five-year term as the RILEM Delegate for the United States, and in this capacity represents 24 US RILEM members. The Paris meetings of April 12-16, 1976, were a series of concurrent meetings of the RILEM Bureau, and the Advisory Group, and the Coordinating Group, and joint meetings of these three groups. As such, this series of meetings was the major planning session of activities for the working year. Mr. William C. Cullen, Assistant Chief, Structures, Materials and Safety Division, CBT, attended the meetings in his official capacity as a member of the RILEM Coordinating Group.

Mr. Cullen was involved in a review of all active RILEM technical committees. The annual, in some cases the triennial, reports of all RILEM technical committees were reviewed in detail. The activities or lack thereof, the progress, the technical accomplishments, the sponsored symposia, and the recommendations of each specific committee were noted and discussed in terms of the planned objectives of each technical committee. A Progress Report of the Coordinating Group to the Permanent Committee of RILEM was prepared. This report which compiles all the technical committee reports, also provides the comments and recommendations of the Coordinating Group to help the technical committee meet their objectives.

The broad scope of RILEM activities are portrayed by the following list of symposia which have taken place in the past two years. Non-destructive testing of non-metallic materials, Constanza, Romania, September 4-6, 1974--Moisture problems in building (CIB/RILEM Symposium), Rotterdam, The Netherlands, September 10-12, 1974--Test and observation on models and structures and their behavior versus time (RILEM/CISM Symposium), September 18-20, 1974--Refractory concretes, Bonn, Germany, October 7-9, 1974--Behavior in service of concrete structures (CEB/CIB/FIP/IABSE/RILEM

Symposium), Liege, Belgium, June 4-6, 1975--Bitumens and Bituminous materials, Budapest, Hungary, September 9-12, 1975--Fibre reinforced cement and concrete, London, UK, September 15-17, 1975--Winter concreting, Moscow, USSR, October 14-16, 1975.

USNCIIR Activities

United States National Committee for the International
Institute of Refrigeration (USNCIIR)
National Academy of Sciences
Washington, D.C. 20418
USA

The XIV Congress of the International Institute of Refrigeration (IIR) was held in Moscow in September, 1975. This Congress meets every four years and the previous Congress was held in Washington, D.C. in 1971. This organization, started in 1908, today consists of more than 50 member countries which represent two-thirds of the world. Official languages are English and French. The Institute consists of management groups and 11 technical commissions covering cryology, thermodynamics, transport processes, refrigerating machinery, biology and food science, and air-conditioning.

The IIR is an intergovernmental body by an agreement reached in Paris in 1954. The scope of the Institute covers all matters relating to the study, specifically requested and will meet production and use of refrigeration in the international field. Approximately 2000 people attended the Congress from about 43 countries and over 400 papers were presented and all of them will be published.

Membership in IIR facilitates keeping up with research and technical advances in over 50 countries, enables CBT to better plan its research program, as well as in developing working relationships with scientists and engineers throughout the world.

In 1957, the US National Committee was established to represent the

interests of the United States in IIR. The Center for Building Technology (CBT) supports the USNCIIR through the National Bureau of Standards with an annual grant of \$2,000.

During FY 1975-1976, three staff members of the Building Environment Division, CBT, participated in the work of IIR, as Commission members.

B-1: Thermodynamics and Transport Processes

Mr. F. J. Powell, Assistant Chief, Building Environment Division, CBT

Mr. POWELL participated in the XIV Congress and, as a member of Commission B-1, took part in the technical and business sessions. He also presented the NBS paper, Development of the Robinson Line-Heat-Source Guarded-Hot-Plate Apparatus for Measurement of Thermal Conductivity by F. J. Powell and C. I. Siu, Thermal Engineering Section, CBT. Commission B-1 specifically requested the NBS site and it will meet at NBS in September 1976. Sessions of all Commissions were held concurrently and several plenary-type sessions were held. Technical visits to local Soviet facilities were also conducted. At the many gatherings, three themes appeared to dominate: how to feed the world utilizing refrigeration technology, energy consumption, and measurement.

D-2: Refrigerated Land Transport

M. C. W. Phillips, Office of Energy Conservation, CBT

During this period, Commission D-2 has concentrated on the development of a standard which includes rating procedures for the heat transfer, heating and refrigeration capabilities of truck trailers, other containers, and railway cars. This commission has also assembled and issued a catalog which lists the worldwide locations of the existing test facilities where the various forms of refrigerated land transport can be measured by these new rating procedures.

EXCHANGE PROGRAMS

In addition to the cooperative research programs previously described the Center for Building Technology maintains close ties with many other building organizations through exchanging building information and making professional visits to research laboratories and organizations worldwide. Many of these organizations are listed below.

Australian Department of Housing and Construction
P.O. Box 690, Canberra City, A.C.T. 2601
AUSTRALIA

Building and Road Research Institute
Council for Scientific and Industrial Research
University P.O. Box 40
Kumasi, GHANA

Building Research Institute
28-8 Hyankunin-Cho 3-Chome
Shinjuku-ku
Tokyo 160, JAPAN

Central Building Research Institute (CSIR)
Roorkee (U.P.), INDIA

Centro de Investigaciones de ingenieria
Ciudad Universitaria Zona #12
Guatemala, City GUATEMALA C. A.

Cement Industry Research Institute (VDZ)
4 Dusseldorf Nord
Tannenstrasse 2, German Federal Republic

Danish Building Research Institute
Postbox 119, DK 2970
Horsholm, DENMARK

Division of Building Research
National Research Council
Ottawa, CANADA KIA OR6

Department of Mechanics
Technion - Israel Institute of Technology
Haifa, ISRAEL

Division of Building Materials
The Lund Institute of Technology
Box 725
220 07 Lund 7, SWEDEN

Institut National des Science Appliques
Direction 209, 20, Avneue A. Einstein
69621 Villeurbanne Cedex, FRANCE

Institute of Concrete and Reinforced Concrete
of the USSR
Gosstroy, 2nd Institutskaya Ul.6
109389 Moscow, USSR

Jamaica Bureau of Standards
Kingston, JAMAICA

Laboratory of Building Technology
State Institute of Technical Research
02150 Otaniemi, FINLAND

National Building Research Institute
Council for Scientific and Industrial Research
P.O. Box 395
Pretoria, SOUTH AFRICA

National Industrial Standards Research Institute
Ministry of Commerce and Industry
199, Dong Sung-Dong
Chong Ro-Ku, Seoul, KOREA

Paint Research Association
Waldegrave Road
Teddington
Middlesex TW11 8LD, ENGLAND

Philippine Bureau of Standards
Quezon City, PHILIPPINES

The Royal Institute of British Architects
66 Portland Place
London, W1N 4AD, ENGLAND

School of Architecture
The Royal Institute of Technology (KTH)
S-100 44 Stockholm 70, Stockholm, SWEDEN

TECHNICAL INFORMATION EXCHANGES

Foreign Guest Workers

The National Bureau of Standards (NBS) makes its facilities available to qualified professionals to pursue individual scientific or technical building projects under conditions that are mutually acceptable. The basis for acceptance of a guest worker is an agreement between NBS and the guest worker which includes the scope of the project, a work plan, and the anticipated time required to carry it out. Information or recommendations from outside organizations supporting a request for the acceptance may be submitted by a prospective guest worker, but such organizations are not considered to have any formal connection with the agreement.

As part of its overall interest in international cooperation, the Center for Building Technology welcomes Guest Workers in line with general NBS policy. During FY 1975-1976 the following Foreign Guest Workers had assignments in CBT on the subjects indicated.

September 1, 1975 -
August 31, 1976

Dr. J. N. Andre
Centre Scientifique et Technique
du Batiment (CSTB)
Grenoble, France
Assigned: Materials and Composites
Section, CBT
Subject: Reduction of Corrosion of
Waterpipes in Buildings.

September 21, 1975 -
July 31, 1976

Dr. Y. Urano
Kyu-Shu University
Fukuoka, Japan
Assigned: Thermal Engineering Section
Subject: The Relationship of Fenestration,
Ventilation and Indoor
Comfort to Energy Conservation
in the Design of Buildings.

March 1975 -
June 1975

Mr. P. J. Sparks
Building Research Establishment
Garston, Watford, England
Assigned: Structures Section
Purpose: Structural Response on
High-Rise Building to
High Wind Loadings.

FOREIGN VISITORS

The Center for Building Technology (CBT) provides an opportunity for foreign visitors to obtain information pertaining to activities conducted at the Bureau and other US building research organizations. Arrangements are made annually to visit US laboratory facilities and technical staff specializing in particular building areas. Thus, building professionals of foreign countries and CBT staff have an opportunity to exchange information and ideas on an informal basis.

July 1, 1974

Dr. G. Schueller
Institute for Massivbau
Technical University of Munich
Munich, GERMANY
Subject: Wind Loads Research

July 1-3, 1974

Mr. J. R. Mayne
Building Research Establishment, DOE
Garston, UNITED KINGDOM
Subject: US/UK Complementary Program

July 4-5, 1974

Prof. H. Ishizaki
Disaster Prevention Research Institute
Kyoto University
Kyoto, JAPAN
Subject: Wind and Pressure Instrumentation

July 9, 1974

Dr. A. Krishnan
Science Attache
Embassy of India, Washington, D.C.
Subject: Building Technology

July 16, 1974

Dr. K. Gottstein
Counselor (Scientific Affairs)
Embassy of Germany, Washington, D.C.
Subject: Energy Construction

July 17, 1974

Mr. R. Florez
Principal Architect
Institute of Research Technology
Sao Paulo, BRAZIL
Subject: US/Brazil Cooperative Program

July 29, 1974	Dr. M. Amorelli, Director State Council of Technology Sao Paulo, BRAZIL Subject: US/Brazil Cooperative Program
August 7, 1974	Dr. J. Holmes (on contract) University of Western Ontario Londen, CANADA Subject: Present Lecture on "Characteristics of Pressure Fluctuations on the Windward Face of a Large Building"
August 15, 1974	Dr. A. Q. K. Afghan, Assistant Secretary Ministry of Science and Technology Dr. Z. A. Hashmi, Chairman Pakistan Science Foundation Dr. A. Wauid, Emeritus Scientist University of Karachi PAKISTAN Subject: Building Technology
August 22, 1974	Mr. D. W. Quinton, Company Chief Engineer Tarmac Construction Ltd. Walverhampton, UNITED KINGDOM Subject: Building Standards
September 3, 1974	Mr. G. Christensen Danish Building Research Institute Horsholm, DENMARK Subject: Energy Conservation
September 5- 6, 10-1974	Mr. D. Dobson National Building Research Institute, CSIR Pretoria, SOUTH AFRICA Subject: Mobile Homes
September 11, 1974	Dr. M. H. Mussavi, Director Chemical and Food Products Industries, ISIRI Mr. A. A. Sabersheikh, Deputy Director General Ministry of Economy, ISIRI Tehran, IRAN Subject: Building Technology
September 13, 1974	Dr. H. Bode Mr. J. Haensel Institut fur Konstruktiven Ingenieurbau II Ruhr - Univessitat Bohn, GERMANY

September 18-20, 1974	Mr. S. J. Leach Building Research Establishment, DOE Garston, UNITED KINGDOM Subject: Energy Conservation
September 20, 1974	Engineering Team (3 members) Kobe Steel Ltd. Kobe, JAPAN Subject: Total Energy Systems
October 1, 1974	Italian Engineering Team (3 members) Italconsult S.P.A. Rome, ITALY Subject: Solar Energy
October 3, 1974	Mr. R. S. Ferguson Division of Building Research, NRC Ottawa, CANADA Subject: Building Fire Codes
October 7-10, 1974	Mr. P. Bakke, Assistant Director Building Research Establishment, BRE Garston, UNITED KINGDOM Subject: Energy Conservation
October 10, 1974	Mr. R. Morse, Director Solar Energy Studies Unit, CSIRO East Melbourne, AUSTRALIA Subject: Solar Energy
October 11, 1974	Dr. P. T. Gurtner Bureau of Housing Bern, SWITZERLAND Subject: Potential Cooperative Program
October 15, 1974	Dr. G. R. Walker James Cook University Queensland, AUSTRALIA Subject: Wind Loads on Buildings
October 19, 1974	Mr. B. Rosengren EUROC Arlov, SWEDEN Mr. R. I. Andreasson, Science Attache Embassy of Sweden, Washington Subject: Energy Conservation
October 18, 1974	Prof. E. Burnett (on contract) University of Waterloo Waterloo, CANADA Subject: Present Report on Progressive Collapse

October 29, 1974	Dr. A. M. Abou-El-Azm, President Academy of Scientific Research and Technology Cairo, EGYPT Subject: Building Technology
October 31, 1974	Japan Combustion Appliances Inspection Association Team (21 members) Tokyo, JAPAN Subject: Building Technology
November 1, 1974	Dr. T. Nishi Tokyo University Kawagoye-City, JAPAN Subject: Building Safety
November 8, 1974	Dr. C. A. Price Building Research Establishment Garston, UNITED KINGDOM Subject: Stone Preservation
November 13, 1974	Dr. R. G. Baker Dr. D. A. Everest National Physical Laboratory Teddington, UNITED KINGDOM Subject: Building Structures and Materials
November 18, 1974	Dr. H. Aoyama University of Tokyo Tokyo, JAPAN Subject: Present Talk "Design Earthquake Loads for Reinforced Concrete Structures"
November 19, 1974	Mr. C. Dahlberg Dr. J. Uhler, Deputy Director National Swedish Board for Technical Development Stockholm, SWEDEN Mr. R. I. Andreasson, Science Attache Embassy of Sweden, Washington Subject: Research Laboratories
November 29, 1974	Dr. J. Schroeder Philips Laboratories Aachen, GERMANY Subject: Energy Conservation

January 9, 1975

Mr. J. C. Knight, Chief
Property Services Division
Department of the Environment
London, ENGLAND
Mr. Colquhoun, Engineering Attache
British Embassy
Washington, D.C.
Subject: Engineering Aspects of
Buildings

March 7, 1975

French Visiting Team
Paris, FRANCE
Subject: General Building Technology

May 20, 1975

Mrs. Anne Dunn
National Research Council of CANADA
Subject: Introduction of NBS Research

June 18, 1975

Mr. Krivoborodov, Member
Soviet Delegation
USSR-US Joint Committee on Construction
in Housing and Other Construction
RUSSIA
Subject: Building Technology

July 17, 1975

Dr. Frank Bromilow
Division of Building Research
Commonwealth Scientific and Industrial
Research Organization
AUSTRALIA
Subject: Technical Operations and
Economics of the Building
Industry and Recent Trends in
Operational Research

July 31, 1975

Mr. Moreira, Director
UDC Urban Development Company
Sao Bernardo, BRAZIL
Subject: Building Technology

September 9, 1975

Dr. Jean Van Keymuelen, Director
Applied Research and Development
BELGIUM Embassy
Subject: Solar Energy and Wind Studies

October 3, 1975

Dr. M. Anandakreshnan
Indian Science Attache
Dr. Bd. Nagchaudhru, Vice-Chancellor
Jawaharlal Nehru University
INDIA
Subject: Energy Conservation

October 15, 1975

Swedish Broadcast System Representatives
SWEDEN
Subject: Heat Pump Project

November 5, 1975	Dr. K. Shirayama, Director Building Research Institute Tokyo, JAPAN Subject: Building Technology
November 11, 1975	Spanish Building and Standard Group (Under US-SPAIN Cooperative Agreement) Subject: Structures, Materials and Insulation Research
November 13, 1975	Mr. R. Proctor-Sims National Building Research Institute SOUTH AFRICA Subject: Information Dissemination
December 10, 1975	Mr. Tutas ROMANIA Subject: Constructional Management
January 8, 1976	Dr. A. Madhava Rao, Scientist Structural Engineering Research Center Adyar, INDIA Subject: Structural Research
January 19, 1976	Mr. Mikio Sakaki, Assistant Director International Affairs Division Science and Technology Agency Tokyo, JAPAN Subject: Information Dissemination of Technical Research
February 6, 1976	Prof. Dieter Kind, President Physikalisch-Technische Bundesanstalt Federal Republic of Germany Subject: Solar Energy
February 9, 1976	Soviet State Committee for Construction Affairs Delegation RUSSIA Subject: Concrete and Cement Testing
February 18, 1976	Dr. Henrique Almeida, Manager Programma Ciencia e Tecnologia BRAZIL Subject: Building Technology
February 24, 1976	Dr. Kim Yung Man, President Korean Institute for Urban Development and Chairman of the Engineering Department of Kook Min University Seoul, KOREA Subject: Architecture and Building Technology

March 10, 1976	Mr. William Allen Bickerdike/Allen/Bramble London, ENGLAND Subject: Building Technology
March 15, 1976	Mr. K. N. Gupta, Scientist National Metallurgical Laboratory Jamshedpur, INDIA Subject: Structural Research
March 18, 1976	Dr. T. L. Webb, Director National Building Research Institute SOUTH AFRICA Subject: Building Research and Architecture
March 19, 1976	Urban Development Team from the Japan Productivity Center Tokyo, JAPAN Subject: Building Technology
March 24, 1976	Mr. T. H. Huang, Division Chief Planning Division, Housing Department Taipei Municipal Government Taipei, TAIWAN Subject: Building Standards
March 26, 1976	Dr. C. H. Van Vierssen, Scientific Attache Royal NETHERLANDS Embassy Subject: Materials
April 14, 1976	Mr. Per Olaf Hanson, Commissioner City of Stockholm Stockholm, SWEDEN Subject: Energy Conservation
April 14-15, 1976	Mr. Jaap Van Straaten National Building Research Institute SOUTH AFRICA Subject: Building Technology
April 20, 1976	Mr. Aharon Amit Standards Institute of Israel ISRAEL Subject: Electronics and Building Engineering
June 4, 1976	Mr. Henry Broniak Israel Institute of Technology Building Research Station Haifa, ISRAEL Subject: Instrumentation, Concrete, and Reinforced Structures.

June 11, 1976

Mr. Fumiyasu Endo
US Correspondent for Japanese
Newspapers
Tokyo, JAPAN
Subject: Solar Energy

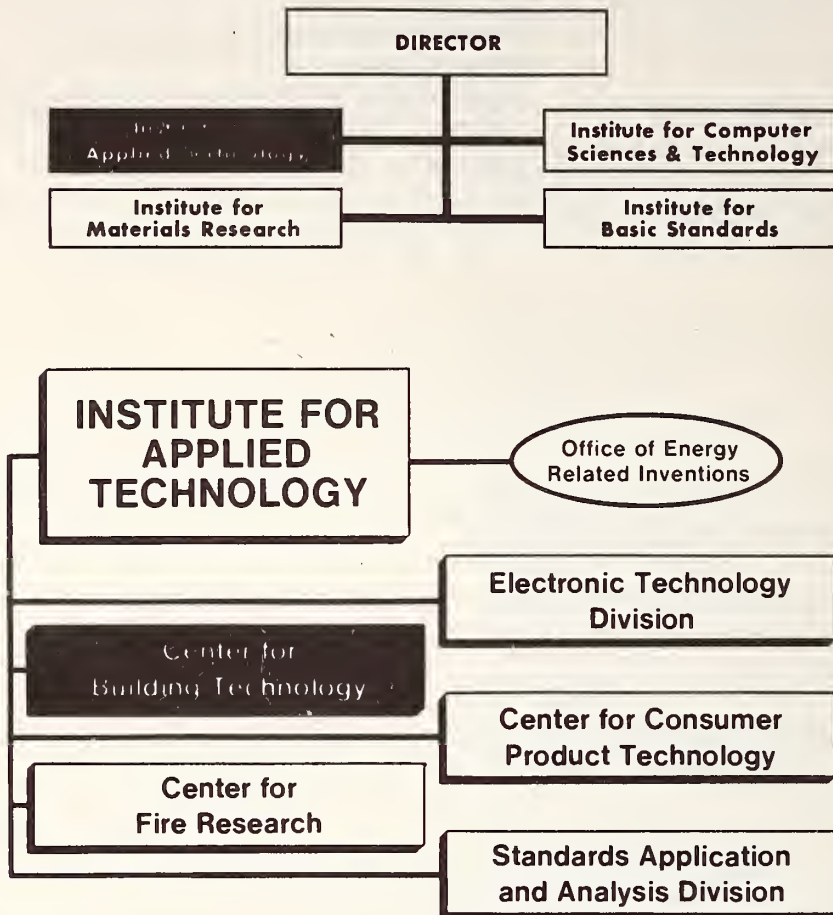
June 14, 1976

Mr. Mete Gurer
Ministry of Reconstruction and
Resettlement
Department of Regional Planning
Ankara, TURKEY
Subject: Disaster Mitigation

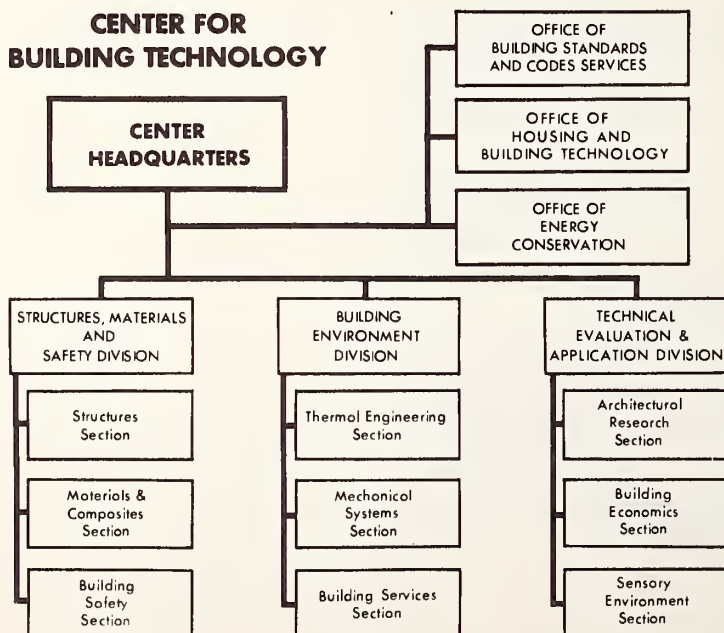
NATIONAL BUREAU OF STANDARDS ORGANIZATION CHART

INSTITUTE FOR APPLIED TECHNOLOGY

CENTER FOR BUILDING TECHNOLOGY



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16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.) This report documents international building research activities of the Center for Building Technology (CBT) during Fiscal Year 1975 and 1976 (July 1, 1974 - June 30, 1976). CBT carries out extensive interactions with foreign and international research organizations to exchange building research efforts. This report presents a summary of CBT's cooperative programs in building technology, international organization memberships, exchange programs, information exchanges, and foreign visits to NBS.			
17. KEY WORDS (six to twelve entries; alphabetical order; capitalize only the first letter of the first key word unless a proper name; separated by semicolons) Building research; cooperative programs; information exchange; international building research; international organization memberships; special foreign currency programs.			
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